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Contributions to the Mesozoic flora of the Atlantic coastal plain, XIII.—North Carolina*

Edward W. Berry

(WITH TWO TEXT FIGURES)

The Upper Cretaceous deposits of North Carolina were rather fully described in 1912 by Stephenson.† A systematic account of the Upper Cretaceous of the state, its faunas and floras, was planned by the late Wm. Bullock Clark and manuscripts were prepared for the North Carolina Geologic and Econonic Survey, which included an account of the invertebrate faunas by Stephenson, of the vertebrates by Gilmore and of the plants by the present writer. These were transmitted to the State Survey in 1916 for publication and have since been lost. What is known of the fossil flora is contained in a number of short papers published by the writer‡ between 1907 and 1910, and these include nearly everything of interest. It has seemed proper to bring the additional identifications together in the present contribution so that our knowledge of the flora may be complete as regards the present collected material.

The complete flora is arranged botanically in the following pages with brief annotations where such seemed necessary. All of the material comes from what is known as the Black Creek formation.

Thallophyta

ALGITES AMERICANA Berry

Algites americana Berry, Bull. Torrey Club, **38**: 401. 1911; Maryland Geol. Surv. Upper Cretaceous 758. *pl. 50, f. 1.* 1916.

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* The last previous contribution of this series appeared in Bull. Torrey Club **44**: 167–190. *pl. 7.* 1917.

† Stephenson, L. W. North Carolina Geol. and Econ. Surv. **2**: 111–145, 306–314. 1912.

‡ Berry, E. W. Bull. Torrey Club, **34**: 185–206. *pl. 11–16.* 1907; *Ibid.* **35**: 249–260. *pl. 11–16.* 1908; *Ibid.* **37**: 181–200. *pl. 19–24.* 1910; Johns Hopkins Univ. Cir. 11. **7**: 79–91. 1907; Am. Jour. Sci. **25**: 382–386. 1908.

This rather indefinite form is rather common at certain circumscribed localities in the upper part of the Black Creek formation in North Carolina and has also been found in the extension of these beds in South Carolina. It occurs also in the Magothy formation of Maryland.

LOCALITIES: Atlantic Coast Line Bridge, Corbits (Old Union) Bridge, and Horrell Landing, Black River, Sampson County.

Pteridophyta

An undeterminable fern from Court House Bluff, Cape Fear River.

Cycadophyta (?)

CYCADINOCARPUS CIRCULARIS Newberry

PODOZAMITES KNOWLTONI Berry

PODOZAMITES LANCEOLATUS (L. & H.) F. Braun

An extended synonymy of this species was published recently in the Maryland Geological Survey volume on the Upper Cretaceous (p. 772. 1916) and need not be repeated in the present connection. The species is wide ranging both geographically and geologically and is undoubtedly composite. The North Carolina material is fragmentary but cannot be differentiated from the forms universally referred to this species.

LOCALITY: Rockfish Creek near Hope Mills, Cumberland County.

Coniferophyta

TUMION CAROLINIANUM Berry
CEPHALOTAXOSPERMUM CAROLINIANUM Berry
PINUS RARITANENISS Berry
CUNNINGHAMITES ELEGANS (Corda) Endlicher
SEQUOIA MINOR Velenovsky
SEQUOIA HETEROPHYLLA Velenovsky
SEQUOIA REICHENBACHI (Geinitz) Heer
ARAUCARIA BLADENSIS Berry
ARAUCARIA JEFFREYI Berry
ARAUCARIA CLARKI Berry
DAMMARA BOREALIS Heer
BRACHYPHYLLUM MACROCARPUM FORMOSUM Berry
ANDROVETTIA CAROLINENSIS Berry
MORICONIA AMERICANA Berry

Angiospermophyta

ARALES

PISTIA NORDENSKIOLDI (Heer) Berry

Chondrophyllum Nordenskioldi Heer, Fl. Foss. Arct. 3^2 114. *pl. 30, f. 4b; 32, f. 11, 12.* 1874.

Pistia Nordenskioldi Berry, Bull. Torrey Club **37**: 189. *pl. 21, f. 1–15.* 1910.

This species has been fully described and figured by the writer in the publication cited. It is exceedingly common at certain localities and in some cases the cuticle is preserved. The epidermal cells are small, prevailingly rectangular and thick walled. The stomata are few and scattered, confined to a single surface of the leaf and altogether absent from the broad leaf bases. They are situated in depressions of the surface and have thin elongated guard cells and two accessory cells.

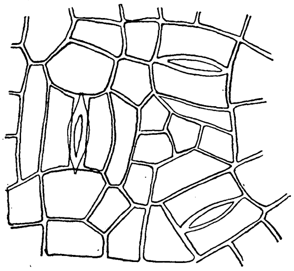

FIG. 1. PISTIA NORDENSKIOLDI (Heer) Berry. Epidermal cell outlines and stomata, × 100.

LOCALITIES: Parker Landing, Tar River, Pitt County; Blackmans Bluff, Neuse River, Wayne County; Sykes Landing (about fifty-seven miles above Wilmington), Corbits Bridge, Big Bend, Atlantic Coast Line Bridge, and Horrell Landing on the Black River, Sampson County.

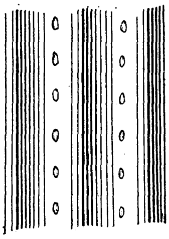

FIG. 2. DORYANTHITES CRETACEA Berry. Longitudinal striations of surface and stomata, × 35.

POALES

PHRAGMITES PRATTI Berry

INCERTAE SEDIS

DORYANTHITES CRETACEA Berry

Doryanthites cretacea Berry, Bull. Torrey Club **38**: 406. 1911; U. S. Dept. Int. Geol. Surv. Professional Paper 84: 108. *pl. 17, f. 3.* 1914; *Ibid.* **112**: 70. *pl. 13, f. 1.* 1919; Maryland Geol. Surv. Upper Cretaceous 806. *pl. 56, f. 6.* 1916.

This species has been sufficiently described in the papers cited, and it remains to refer briefly to the stomata. The longitudinal veins are immersed and in the valleys are longitudinal rows of small similarly oriented elliptical stomata with pairs of normal guard cells. Both surfaces of the leaf are exactly alike. This species occurs in the Magothy formation of Maryland, the Eutaw formation of Alabama and Tennessee and the Ripley formation of Georgia and Tennessee. In the Black Creek formation of North Carolina it is found at Rockfish Creek near Hope Mills in Cumberland County and at ninety two and ninety-five and one half miles above Newbern on the Neuse River in Wayne County.

MYRICALES

MYRICA ELEGANS Berry

MYRICA CLIFFWOODENSIS Berry

JUGLANDALES

JUGLANS ARCTICA Heer

SALICALES

SALIX FLEXUOSA Newberry

SALIX NEWBERRYANA Hollick

SALIX LESQUEREUXII Berry

SALIX EUTAWENSIS Berry

FAGALES

QUERCUS? PRATTI Berry

This is an extremely doubtful form of slight botanical interest and is probably not a *Quercus*.

QUERCUS PSEUDOWESTFALICA Berry

Quercus pseudowestfalica Berry, U. S. Dept. Int. Geol. Surv. Professional Paper 84: 35. *pl. 9, f. 5.* 1914.

This species, sufficiently described in the paper cited and based upon material from the Middendorf beds of South Carolina, is found in the Black Creek formation of North Carolina at Court House Bluff, Cape Fear River, Bladen County.

URTICALES

PLANERA CRETACEA Berry

FICUS DAPHNOGENOIDES (Heer) Berry

FICUS INAEQUALIS Lesquereux

FICUS STEPHENSONI Berry
FICUS OVATIFOLIA Berry
FICUS CRASSIPES (Heer) Heer

Proteoides crassipes Heer, Fl. Foss. Arct. 3^2: 110. *pl. 31, f. 6–8a.* 1874.

Ficus crassipes Heer, *Ibid.* 6^2: 70. *pl. 17, f. 9a; pl. 24, f. 1, 2.* 1882: Lesquereux, Mon. U. S. Geol. Surv. **17**: 79. *pl. 13, f. 3.* 1892; Berry, Bull. Torrey Club **33**: 172. 1906.

The leaves of this species as they occur in the southern Coastal Plain are narrowly lanceolate with a gradually narrowed apex and base, about 15 cm. in length by 2.5 cm. in greatest width, resembling *Ficus atavina* Heer in outline but relatively narrower. The texture is coriaceous and the midrib and petiole often extraordinarily stout. The secondary venation when seen is of the usual camptodrome type with relatively long ascending secondaries. This species was described originally from the Atane beds of western Greenland, the first rather fragmentary specimens collected having suggested the genus Proteoides. It was subsequently recorded from the Dakota sandstone of Kansas. In the Atlantic Coastal Plain it has been found in the Tuscaloosa, Magothy, Eutaw, Middendorf and Ripley formations. In the Black Creek formation of North Carolina it is found at Court House Bluff, Cape Fear River, Bladen County.

FICUS FRUCTUS

Typical *Ficus* fruits occur at several localities in the Black Creek formation. At Court House Bluff they are associated with at least five foliar species of Ficus. They are about 2.3 cm. in length by 1.1 cm. in maximum diameter. Among previously described forms they are very close to, if not identical with, the figs described by Heer from the Atane beds of Greenland and referred on the basis of association to *Ficus atavina* Heer.* The last is a widespread Upper Cretaceous species which has been found in the Middendorf beds of South Carolina.

LOCALITIES: Court House Bluff and Elizabethtown, Cape Fear River, Bladen County.

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* Heer, Fl. Foss. Arct. 3:^{2} 108. *pl. 30, f. 5–7.* 1874.

ARISTOLOCHIALES

Aristolochites Heeri sp. nov.

Leaves of medium or small size, markedly inequilateral in general outline, with a deeply cordate or auriculate inequilateral base and a pointed apex. Margins entire. About 7.5 cm. in length by 4 cm. in maximum width, which is in the basal half of the leaf. Petiole wanting. Midrib stout, prominent, curved. Secondaries stout, diverging from the midrib at wide angles, camptodrome; three or four pairs of reduced caliber diverge fasciculately in the ears from the base of the midrib.

This characteristic species is based upon scanty and fragmentary material. The genus is represented in the Dakota sandstone of the West and in the Arctic Cretaceous, and *Aristolochia*-like fruits and leaves occur from the Eocene onward.

LOCALITY: Court House Bluff, Cape Fear River, Bladen County.

RANALES (?)

DEWALQUEA GROENLANDICA Heer (?)

Dewalquea groenlandica Heer, Fl. Foss. Arct. **6**^{2}: 87. *pl. 29, f. 18, 19; pl. 42, f. 5, 6; pl. 44, f. 11.* 1882.

The North Carolina occurrence is based upon incomplete material collected in 1906, and since no additional material has been discovered I have queried the identification. The question of the correctness of this determination is at best of little significance, either geological or biological. There is some question regarding the generic identity between this species and the type of the genus *Dewalquea* which cannot be settled until better material is discovered, and there is also wide difference of opinion regarding the botanical affinities of *Dewalquea*, some students seeing resemblances to the Ranunculaceae and others to the Araliaceae.

LOCALITY: Blackmans Bluff, Neuse River, Wayne County.

CHENOPODIALES

PISONIA CRETACEA Berry

RANALES

MAGNOLIA CAPELLINII Heer

MAGNOLIA NEWBERRYI Berry

LIRIODENDRON DUBIUM Berry

LIRIODENDRON PRIMAEVUM Newberry (?)

MENISPERMITES CYCLOPHYLLUM Lesquereux (?)

Very typical fragments of some species of *Menispermites* are present in the collections. The material is too incomplete for description but indicates a relatively small form very similar to the Dakota sandstone species *Menispermites cyclophyllum* Lesquereux.[*] The genus is very common in the earlier part of the Upper Cretaceous in both this country and Europe, as well as in the Arctic region, and continues in the Atlantic Coastal Plain well toward the close of the Cretaceous.

LOCALITY: Court House Bluff, Cape Fear River, Bladen County.

ROSALES

LEGUMINOSITES ROBINIAFOLIA Berry

PHASEOLITES FORMUS Lesquereux

GLEDITSIOPHYLLUM TRIACANTHOIDES Berry

GERANIALES

CITROPHYLLUM ALIGERUM (Lesquereux) Berry

Ficus aligera Lesquereux, Fl. Dak. Group 84. *pl. 10, f. 3–6.* 1892.

Citrophyllum aligerum Berry, Bull. Torrey Club **36**: 258. *pl. 18A, f. 1–8.* 1909; Bull. New Jersey Geol. Surv. **3**: 169. *pl. 21, f. 1–8.* 1911; U. S. Dept. Int. Geol. Surv. Professional Paper 84: 47. 1914.

The occurrence of this species in North Carolina is based upon two fragmentary specimens which are in close agreement with the type but with only a slightly and not conspicuously alate petiole. In this last respect it is exactly like some of the material from the Magothy formation.

LOCALITY: Three and a half miles below Dunbar Bridge, Tar River, Edgecomb County.

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[*] Lesquereux, Cret. & Tert. Flora, 79. *pl. 15, f. 3.* 1883.

EUPHORBIALES

MANIHOTITES GEORGIANA Berry

Manihotites georgiana Berry, Bull. Torrey Club **37**: 507. *f. 1, 2.* 1910; U. S. Dept. Int. Geol. Surv. Professional Paper 84: 114. *f. 2, 3; pl. 22; 23, 24, f. 4, 5.* 1914.

This remarkable species has been fully described in the publications cited. It is found in the Eutaw formation in Georgia and Tennessee, in the Ripley formation of Georgia and Tennessee and in the upper part of the Bingen sand in Arkansas.

LOCALITY: Neuse River, eighty-seven and a half miles above Newbern, Wayne County.

SAPINDALES

CELASTROPHYLLUM CRENATUM Heer
CELASTROPHYLLUM UNDULATUM Newberry

MALVALES

PTEROSPERMITES CAROLINENSIS Berry
PTEROSPERMITES CREDNERAFOLIA Berry

THYMELEALES

CINNAMOMUM HEERII Lesquereux
MALAPOENNA HORRELLENSIS Berry
LAUROPHYLLUM ELEGANS Hollick
SASSAFRAS ACUTILOBUM Lesquereux

Sassafras acutilobum Lesquereux, Cret. Flora, 79. *pl. 14, f. 1, 2.* 1874.

This species is apparently widely distributed and almost as variable as the modern *Sassafras.*

LOCALITY: Court House Bluff, Cape Fear River, Bladen County.

MYRTALES

EUCALYPTUS ATTENUATA Newberry
EUCALYPTUS LINEARIFOLIA Berry
EUCALYPTUS GEINITZI Heer

The foregoing three species are believed to represent *Myrcia* or some similar genus of the Myrtaceae. They are not considered to represent *Eucalyptus* and should probably be referred to the form-genus *Myrtophhyllum.*

UMBELLALES

CORNOPHYLLUM OBTUSATUM Berry

Cornophyllum obtusatum Berry, U. S. Dept Int. Geol. Surv. Professional Paper 112: 129. *pl. 26, f. 7, 8.* 1919.

This species is sufficiently described in the publication cited and was based upon material from the Tuscaloosa formation of Alabama.

LOCALITY: Court House Bluff, Cape Fear River, Bladen County.

HEDERA PRIMORDIALIS SAPORTA

ERICALES

ANDROMEDA PARLATORII Heer
ANDROMEDA GRANDIFOLIA Berry
ANDROMEDA NOVAECAESAREAE Hollick
KALMIA BRITTONIANA Hollick (?)

PRIMULALES

MYRSINE BOREALIS Heer
MYRSINE GAUDINI (Lesquereux) Berry

EBENALES

DIOSPYROS PRIMAEVA Heer

GENTIANALES

ACERATES AMBOYENSE Berry

INCERTAE SEDIS

Carpolithus carolinensis sp. nov.

A symmetrically ovate, ligneous, biloculate, compressed capsule, pointed at both ends, about 10 mm. in length and 7 mm. in maximum width, midway between the apex and the base.

Of unknown botanical affinity.

LOCALITY: Big Bend, Black River, Sampson County.

Carpolithus bladenensis sp. nov.

A smooth hard nutlet, drupaceous stone or seed, almost perfectly elliptical in outline when viewed from either the front, side or end. Length 11 mm., width 5 mm., thickness 2.3 mm.

Species obviously distinct, based upon a single specimen from the dark clays of the Black River. In form it suggests such modern stones as those of *Cornus florida* or *Nyssa biflora* but the dark polished surface is perfectly symmetrical. Botanical affinity unknown.

LOCALITY: Atlantic Coast Line Bridge, Black River, Sampson County.